



## Bilateral flexor tendon contracture following onychectomy in 2 cats

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**Abstract** — Two cats presented with bilateral flexor tendon contracture following onychectomy. This previously unreported complication proved to be painful and debilitating. Deep digital flexor tenectomy successfully resolved the problem. Twelve months after surgery, the first cat remains free of complications. The second cat recovered full limb function, but died of unrelated causes.

**Résumé** — **Contracture bilatérale du tendon fléchisseur chez 2 chats à la suite d'une onychectomie.** Deux chats ont été présentés pour contracture bilatérale du tendon du fléchisseur à la suite d'une onychectomie. Cette complication, non rapportée à ce jour, s'est avérée douloureuse et débilitante. Une ténectomie du fléchisseur profond des doigts a résolu le cas. Douze mois plus tard, le premier chat ne présentait toujours pas de complications. Chez le deuxième chat, la fonction des membres s'était parfaitement rétablie mais le chat est mort de causes non reliées à la condition.

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Onychectomy is commonly performed in small animal veterinary practice. It is usually performed to prevent cats from scratching. The procedure is generally regarded as routine by veterinarians, with several techniques currently being used. However, there is an exceptionally high complication rate, 50% in the immediate postoperative period (during hospitalization period) and 19.8% in the late postoperative period (the period following hospital discharge) (1). Early postoperative complications include pain, hemorrhage, laceration of the digital pad, swelling, reluctance to bear weight on affected limbs, neuropraxia from improper tourniquet use, and lameness. Late postoperative complications include infection, tissue necrosis from improper bandage application, wound dehiscence or incomplete healing with protrusion of the 2nd phalanx (P2), regrowth from the ungual process of the 3rd phalanx (P3) or scurs (production of deformed claw segment from epithelial cells of the ungual crest), retention of flexor process of P3, chronic draining tracts, palmigrade stance, and chronic intermittent lameness (1–4). To the authors' knowledge, there have been no previously reported complications involving flexor tendon (musculotendon complex) contracture following onychectomy.

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### Case description

A 3.6 kg, 7-month-old, male neutered domestic shorthair was presented to a specialty referral practice for a bilateral thoracic limb lameness. Six weeks earlier, a bilateral forepaw onychectomy had been performed using a scalpel blade technique. No intraoperative complications were encountered and recovery was considered routine. Upon examination, the cat was fractious and reluctant to bare weight on his forelimbs. He preferred to sit with his forepaws elevated above the ground. The forelimbs, including all of the digits, were held in flexion. Ambulation was achieved by walking in an upright position, using only the pelvic limbs.

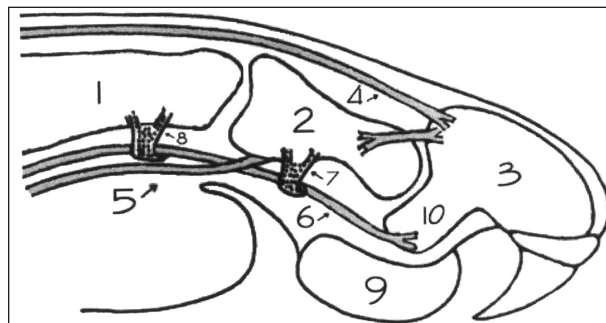
Sedation with medetomidine hydrochloride (Domitor; Orion Corporation, Finland), 0.01 mg/kg body weight (BW), SC, and butorphanol tartrate (Torbutrol; Forte Dodge Animal Health, Forte Dodge, Iowa, USA), 0.1 mg/kg BW, SC, was necessary to fully examine the thoracic limbs. Palpation revealed that all digits of both frontpaws were fixed in flexion and that they could not be extended manually. Radiographs (Figure 1) confirmed flexion of the forelimb digits. There was no evidence of retention of remnants of P3. Collectively, these findings were consistent with a diagnosis of bilateral flexor tendon contraction. Surgery was elected in an attempt to alleviate the constraining effect of the deep digital flexor tendon. Following premedication with hydromorphone (Hydromorphone USP; Elkins Sinn, Cherry Hill, New Jersey, USA), 0.1 mg/kg BW, SC, general anesthesia was induced with propofol (Propoflo; Abbott Laboratories, Chicago, Illinois, USA), 6 mg/kg BW, IV. An endotracheal tube was placed and anesthesia maintained with isoflurane (IsoFlo; Abbot Laboratories) and



**Figure 1.** Lateral radiographic view of contracted pes, case 1. Note the flexion between P1 and P2 of all digits.

oxygen. The cat was placed in dorsal recumbency for surgery. Hair was clipped from both forepaws and a routine preparation for surgery was performed. A 5-mm longitudinal incision was made on each digit immediately proximal to the digital pad. Following blunt dissection, the deep digital flexor tendon was identified. The tendon was elevated by means of a curved hemostat and approximately 5 mm of the tendon was excised (1). This tenectomy procedure was performed on all forelimb digits. Each incision was closed by using a 4-0 poliglecaprone (Monocryl; Schering Plough, New Jersey, USA) subcuticular cruciate suture. Postoperative analgesia was provided by administering hydromorphone, 0.1 mg/kg BW, SC, q4h, overnight. Within 24 h, the cat was placing his forepaws and appeared considerably more comfortable. Follow-up phone calls to the owner at 10 d, 3 mo, and 12 mo, postoperatively, revealed that the cat was ambulating normally and without pain. Furthermore, the owner reported that the cat had returned to his usual affectionate preonychectomy disposition.

A 2.8 kg, 14-month-old, male, neutered rex was evaluated at Purdue University Veterinary Teaching Hospital for forelimb lameness. Onychectomy had been performed 3 mo earlier; it is unknown what technique had been used. Examination revealed that the cat was reluctant to ambulate, preferring instead to crouch with his forelimbs tucked under his body. There was bilateral hyperflexion of joints involving the thoracic limb phalanges. Upon palpation of the forepaws, the cat became uncomfortable. The cat was sedated with acepromazine maleate (Aceroject; Vetus Animal Health, Rockville Centre, New York, USA), 0.01 mg/kg BW, SC, and butorphanol tartrate (Torbutrol), 0.3 mg/kg BW, SC, for evaluation. Radiographs revealed hyperostosis of the distal half of P2 in essentially all digits and minimal soft tissue coverage over the distal ends of P2. Results from a complete blood (cell) count, biochemical panel, and urinalysis were unremarkable. The cat was premedicated with acepromazine maleate, 0.1 mg/kg BW, SC, induced with 2.5% thiopental sodium (Pentothal; Abbott Laboratories), 10 mg/kg BW, IV, intubated, and maintained on isoflurane and oxygen. Staged bilateral tenectomies 3 wk apart



**Figure 2.** Felid digit anatomy.

1. 1st phalanx; 2. 2nd phalanx; 3. 3rd phalanx; 4. Common digital extensor tendon; 5. Superficial digital flexor tendon; 6. Deep digital flexor tendon; 7. Distal digital annular ligament; 8. Proximal digital annular ligament; 9. Digital pad; 10. Flexor tubercle of 3rd phalanx.

were performed, as in case 1. Postoperative analgesia was provided with hydromorphone (Hydromorphone USP), 0.1 mg/kg BW, SC. Operative findings included fibrosis and adhesions between the deep digital flexor tendon and soft tissues adjacent to P2 in some digits. A hematoma was noted within the deep digital flexor of the 3rd digit on the right pes. Histopathologic examination of the resected tendon revealed “normal” tendon surrounded by a sheath of granulation tissue. There was no obvious infectious or neoplastic process. A gradual return to normal forelimb function was observed on recheck, 1 and 2 wk postsurgery. The cat was euthanized for unrelated reasons 7 mo after the tenectomies.

## Discussion

Onychectomy is the process whereby P3 is surgically resected. A thorough knowledge of the anatomy of the pes is necessary for understanding potential complications (Figure 2). The common digital extensor tendon attaches to the ungual crest of P3 and through its muscle provides digital extension and maintains digitigrade stance. Through contraction of their respective muscles, the deep and superficial digital flexor tendons are responsible for digital flexion. In particular, the deep digital flexor tendon is responsible for flexion of the distal interphalangeal joint and the superficial digital flexor tendon enables flexion at the level of the proximal interphalangeal joint. Following onychectomy, paw flexion is maintained by the superficial digital flexor tendon (3). The inability of the 2 cats to completely extend their forelimb digits and their dramatic improvement following surgery, supported a diagnosis of deep digital flexor tendon contracture.

To the best of the authors' knowledge, digital flexor tendon contracture has not been previously reported as a complication associated with onychectomy. However, it is possible that this complication was previously considered under the broad category of “long term” lameness. In a previous retrospective study (1), “long term” lameness was described in 1 cat as an intermittent elevation of one or both paws while sitting in an upright position. Both cats reported in this paper exhibited a similar posture.

This abnormal posture and the painful pedes can be explained by the cats being forced to ambulate on the distal aspects of P2. Radiographs demonstrated the complete removal of P3 on all digits in both cats. The finding of hyperostosis of P2 in the 2nd case may have resulted from persistent trauma, secondary to minimal soft tissue coverage of the distal aspects of P2. It is thought that the flexor tendon contracture resulted in rotation of the distal aspect of P2 into a relatively unprotected position, with scant tissue coverage.

It is hypothesized that the etiology of the flexor tendon contracture was postoperative inflammation. Suboptimal surgical technique when performing onychectomy may result in excessive tissue trauma. Errors in surgical tech-

nique may include excessive or rough tissue manipulation, use of a dull scalpel blade, improper use of tissue adhesives, or poor aseptic technique. The combination of bacterial contamination and tissue trauma may then incite an intense inflammatory response. This may result in flexor tendonitis, fibrosis, adhesion formation, and flexor tendon contracture (6).

Tendonitis results in fibrosis, vascular hyperplasia, and infiltration of inflammatory cells around the tendon and tendon sheath. Other less commonly observed histopathological findings include ischemic necrosis, edema, cartilaginous or osseous metaplasia, and vascular dilation (6). Histopathologic examination of the deep digital flexor tendon from the 2nd case was consistent with granulation tissue, explaining the adhesions seen intraoperatively.

Deep digital flexor tendon tenectomy successfully resolved the thoracic limb lameness in the 2 cases described in this paper. The "mini" palmar approach was simple and provided direct visualization of the deep digital flexor tendon. The tenectomies in case 2 were staged, as the surgeon had not seen this declaw complication before and wished to take a conservative approach.

In light of this previously unreported complication and other well established complications, veterinarians must maintain aseptic technique and adhere to minimal and atraumatic handling of the surrounding soft tissue when performing onychectomies. By ensuring adequate hemostasis and sharp surgical instruments/blades, tissue trauma can be minimized and this complication may be avoided.

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